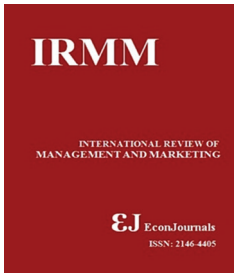

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An Analysis of Factors that Affecting the Number of Car Sales in Malaysia

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ABSTRACT

This study investigates the relationship between macroeconomic variables and number of car sales in Malaysia. The main objective is to determine the factors that affecting the number of car sales in Malaysia. This research covers the time period from 1985 to 2014. The analysis methods that have been applied in this study include descriptive statistics, multiple regression statistics and correlation analysis. The findings shows that gross domestic product has positive relationship with the number of car sales in Malaysia, while interest rate, unemployment rate and inflation rate have negative relationship with the number of car sales in Malaysia. The findings were consistent with the previous findings done by other researcher.

Keywords: Car Sale, Gross Domestic Product, Interest Rate, Unemployment Rate, Inflation Rate
JEL Classifications: J6, L81

1. INTRODUCTION

The populations in ASEAN region are more than 500 million people. Malaysia, which located in a strategic place in ASEAN region provide good opportunities for the worldwide automotive manufacturers. Besides that, same opportunities also had been offered to the component manufacturing and distribution sectors in the country. In the effort to attract the automotive manufacturers and major international component to invest in Malaysia, government has developed good government policies which emphasizes on political and economic stability, well economic fundamentals, as well as practical. Furthermore, government builds infrastructure and skilled labor force and education in their move to attract investment.

Before the establishment of the national car project, Malaysia automobile industry only plays the role as car assemblers. With the establishment of Proton and Perodua, Malaysia no longer play the role as car assemblers but also car manufacturers? As an infant industry, the engineering and industry support play a significant role. Through continuous development in engineering and industry support, the skills level, technology and engineering capabilities in automotive industry had been improved. The global automotive manufacturers choose Malaysia as their base because these factors have attracted them to invest. Malaysia began to involve in automotive industry during 1960s. Before that, majority of the cars purchase by Malaysia consumers were imported in completely built up (CBU) form. The Malaysian government show their interest in setting up automotive industry when the Colombo Plan experts give recommendation in 1963. In May 1964, initial policy on car assembly and manufacture of component parts plants had been reveal by Malaysian government.

In the late 1960s, assembly plant was established.The assembly plant has create job opportunities and target to substitute the imported cars. Several policies had been adopted by government as the move to promote the local automotive industry and encourage vehicles to be manufactured domestically. One of the policy required the vehicle build must include the domestic vehicle parts and components. The percentage of the local vehicle parts were

determined by government. The imported cars required to pay the imports taxes where import tariffs apply on all CBU. Besides the tariff protection, government required all distributors and dealers of imported car to acquire the import license. The import license only valid for 6 months and have to renew when expired. A number of six assembly plants started their operations when approved by government in 1967. The Swedish Motor Assemblies Sdn. Bhd. also began its production in December 1967.

The Proton and Perodua have successfully dominated the Malaysian auto market by having about 90% of the cars sold annually in 1998. The remaining 10% are competing by 25 other manufacturers. The successful of Proton and Perodua is due to the effort of Malaysia government. Malaysia government implemented high tariff on the imported cars to protect Proton and Perodua to control the majority of Malaysian auto market.

The contribution of the automobile industry getting important in the economic development of Malaysia since 1985. The establishment of Proton and Perodua lead to decrease in the import of the foreigner cars. Besides, it increases the national income by export cars to other countries.

The development of automobile industry leading Malaysia toward becomes an industrial nation. It creates chain effect for the growth of supporting and ancillary industries. Besides, the expansion of local components had been accelerated. The result of this expansion is that metal as well as aluminum industries also improved. In the effort to support the national car project, millions of ringgit had been spend by Malaysia government to improve the road condition, built more roads, highways and bridges. This is to make sure the complete transport system and strengthen the infrastructure to prevent the problem accommodate by the heavy traffic congestions. To retain its competitiveness and its stable economy, Malaysia realizes that expansion of trade is vital for the country; therefore, Malaysia is constantly seeking for new markets for its products (Alshammary and Islam, 2014a).

The success of emerging economies from Asia, in terms of their exports, has ignited great interest to comprehend the international marketing strategies used to enhance export performance in the Asian region. Generally, when firms begin penetrating into a foreign market, the main step towards successful international market penetration, is the correct selection of suitable international marketing strategies to ensure adaptation to products exported. Therefore, globalization throughout the international market is significant for international marketers to understand the extent of adaptation of their products in international markets (Alshammary and Islam, 2014b).

A research like this is essential to assess and improve service delivery and design, because it will provide management with data that they can use in making inferences about the customers. Thus the results of this study should be proved useful for academics; business in the field of marketing and management researchers of customer satisfaction and service quality especially in service sector organization (Islam et al. 2014). Market implications help in either encouraging or discouraging the purchase of such product in the economy. It may also help in determining the direction of the local industries and the marketability of their product, which help in increasing productivity or improvement in such products (Islam and Abdullah, 2013).

To protect the local automobile industry, Malaysia government maintains some protective measures. It is important to protect the national automobile since it is still infant industry. The measures aims to ensure the producers and suppliers to prepared themselves in the domestic competition and eventually compete in the international market. The protective measures include tariff and non-tariff barriers, the local content policy and licensing system. There are only two national car manufacturer, Proton and Perodua in Malaysia. One major factor in the successful of national automotive industry is Malaysian Automotive Policy. Implementation of these policies protects the country's automotive industry from competition of imported cars. National cars able to dominate the domestic automobile market because of the protection by government which shelter them from competition.

The main purpose of conducting this research is because the sales of national car are lower than the imported car in the same price range. From the announcement by media and government agencies, the demand for national cars indicates a declining trend compare to previous years. Consumers prefer to buy a foreign car that are slightly expensive than national car rather than buying a national car (Tan and Govindan, 2014).

From Table 1 above, the number of car sales in Malaysia had been showed from year 1994 to 2014. In Malaysia, to ensure the competitive advantage of local car manufacturer, AP or approved permits were introduced for more than 20 years ago to make sure the imported car were priced significantly expensive than the local car manufacturer like Proton and Perodua. This policy makes many foreign car manufacturers disappointed but the government

Table 1: Number of car sales in Malaysia from year 1994 to 2014

Year	Proton	Perodua	Total National car sales
1994	111,300	8880	120,180
1995	140,647	39,906	180,553
1996	176,100	46,941	223,041
1997	196,806	58,255	255,061
1998	87,489	38,921	126,410
1999	155,720	66,499	222,219
2000	178,960	82,484	261,444
2001	208,746	94,476	303,222
2002	214,373	114,265	328,638
2003	155,420	121,347	276,767
2004	166,833	120,461	287,294
2005	166,118	138,466	304,584
2006	115,551	155,416	270,967
2007	117,624	162,141	279,765
2008	141,782	167,392	309,174
2009	147,744	166,735	314,479
2010	156,960	188,641	345,601
2011	158,601	179,989	338,590
2012	141,120	189,137	330,257
2013	138,753	196,071	334,824
2014	115,000	195,000	310,000

Source: wikimedia.org

claimed that they have the right to impose the policy to protect the local car manufacturer. Under this policy, to import a car, people needed approved permits. Furthermore, import duties between 140% and 300% will be charged for buying a foreign-made car (Leow and Husin, 2015).

However, the APs applied on the imported foreign cars were too low. This gives the opportunity for the car dealer able to provide high discounts on the car and enjoy good sales for the imported cars. The previous study showed that it used to be 6 out of 10 cars on the road are local manufactured but the recent survey shows that the national brands only make up 46.8% of total market share. The street is now full with imported cars as they can be bought at an almost same price range for some model of local produced car. For instance, a new Toyota Vios is priced about RM70, 000 where the local car like Proton Inspira are about the same price range. The consumers will prefer a foreign cars based on the concept foreign branded is better for the same price range or slightly higher (Khamis and Abdullah, 2014).

This research study is being carried out to identify the factors that affecting the car sales in Malaysia. After identify the factors, the local car makers should know the factor that affect the car sales and react towards the factor to maintain their competitiveness. Therefore it can ensure future automobile industry in Malaysia able to compete with foreign cars. It is noticeable that existence of particular factors affecting the demand for the national cars. To make the present market for the local car become better, these factors needed to be identify as the automotive industry emerging as important industry in economic growth. Imagine that when Malaysian buy more foreign cars than local cars, the money will be outflow and not circulating within Malaysia, the national balance become deficit when import exceed export. Besides that, without sufficient demand from consumers, the national car manufacturers eventually need to reduce their production and start to cut off production cost. This will lead to higher unemployment rate (UR). The chain reaction will affect the growth rate of Malaysia's economic.

2. LITERATURE REVIEW

2.1. Factors that Influence Car Sales

According to Khamis and Abdullah, (2014), there had been a steady growth rate in Malaysia's automobile industry. This growth rate is through the joint venture with others car manufacturer countries by improve technology in car products. The establishment of Perusahaan Automobil Nasional Berhad (Proton) IN 1985 and Perusahaan Otomobil Kedua Sdn Bhd (Perodua) lead to a new chapter in Malaysia automobile industry, homemade car. The car sales of Proton and Perodua are influenced by various factors. A study by Leow, and Husin (2015) showed that product and price have positive relationship on car purchase intention. In their study, they deployed the cross-sectional research design including both the qualitative research and quantitative research. Their measures are based on service quality, product quality, price fairness, customer satisfaction, trust and purchase intention. They had 389 samples interviewed and 65% of the samples were males. Their results showed that majority of their hypothesis were accepted expect for the relationship between price competitive and product survival. The result implies that price is one of the factor influenced car purchased intention but not the most significant. Another study conducted by Toh, (2006) to find empirical evidence for the factor that influence the national car sales. In her study, she investigate the relationship between 4P (Product and Services, Price, Promotion and Place) and national car. However, the demand for national car only limited for Kuching, Sarawak. The sample size was determined using equation introduced by Luck in 1987. The sample sizes were 138 people according to her calculation but she only managed collected back 100 sets proper questionnaires. For the data analysis, data obtained were analyzed using descriptive and inferential statistics. From her analysis results, the dominant factors for the demand of national car were promotion and price. The road show which under promotion had the highest value which about 0.737 in rotated component matrix, followed by pricing strategy by car manufacturer, 0.695 in rotated component matrix. Finally in her study, place was less significant compared to other factors in the influence the national car sales. Choy et al. (2011) conducted a research in Klang Valley, Malaysia to find the factors that affect the purchase decision on automobile. They have identified consumers' perceived quality, perceived value and perceived risk as their independent variables. The research methodology used by them was survey by distributing questionnaires to the target samples between age 23 and 65 years old and above. A total of 200 sets of data were collected where the Cronbach's alpha for each data greater than 0.6. This means that the data was reliable. They had done the internal reliability test to make sure the stability and consistency in measurement. To examine the relationship between the independent variables and dependent variable, multiple regression analysis had been used. From their regression result, all the independent variables (perceived quality, perceived value and perceived risk) have positive relationship with the dependent variable. The perceived quality is the main consideration of consumers when they wish to buy cars. This result is consistent with the study conducted by Dae and Joon (2009) which also showed that perceived quality have positive relationship with car purchase decision. Muhammad et al. (2013), investigated the relationship between macroeconomic variables and passenger vehicle sales in Malaysia in his study. The macroeconomic variables he aims to study were consumer price index (CPI), index of industrial production (IPP), oil price and monetary policy rate (ONR). To determine long-term and short-term causal relationship between independent variables and dependent variable, he used the vector autocorrelation (VAR). The data was time series of monthly data collected from Economic Planning Unit, Malaysia. Stationary Test was used to determine the stationary degree of each variable. From the test result obtained, it showed that the sale of passenger vehicles in Malaysia was influenced in two pathways. First, the CPI variables to the industrial production (IPP). Second, the oil price variables to the IPP. An IPP variable has significant effect on the sales of passenger vehicles in Malaysia. This showed that economic levels have influence on the sales of passenger vehicles in Malaysia. The higher the income, the higher the demand for passenger vehicle sales in Malaysia. Another study by Nawi, et al. (2013) showed that the sales of passenger cars in Malaysia also influenced by various macroeconomic factors. The factors that they examined

included gross domestic product (GDP), interest rate (ITR), CPI, exchange rate (ER) and UR. A total of 30 years data from 1981 to 2010 were used in their study. At first, passenger car sales, GDP, ITR, ER and unemployment showed that they were insignificant at the first stage (Level) for both augmented Dickey-Fuller (ADF) and Philip-Perron (PP) test. After running the second stage (first difference), the result indicated that all variables are significant for both test because the value is below 0.05 which fulfilled the condition where data is consider significant when below 0.05. They found that there are positive relationship between car sales and the nominal GDP. According to Automotive Research, there was positive relationship between vehicles sales growth and annualized GDP.

2.2. GDP

According to Rahman, (2013), GDP used to measure the economic performance of a country. Besides, GDP also defined as total market values of all final goods and services produced in a country in a given year. From the study by Mallett and Keen, (2012) supported that GDP measure the growth in the economy. In their study, they analyze the GDP able to measure economy growth and no only the growth in money supply through empirical evidence from GDP of nine countries. GDP was developed by Dr. Simon Kuznets in 1934 for used as the basis for some derivative statistics. According to Sivak and Tsimhoni, (2008), GDP has a positive relationship with the car sales. Their conducted their study in 25 developing countries, including Malaysia. They applied multiple regression method to analyze by using the data in the year 2006 on the current sales of the new cars on current GDP and population. From their finding, GDP and population was highly significant where the $r^2 = 0.93$ showing that 93% of the variance can be explained using the model. The interesting part in their equation was population has a negative coefficient. This is explained by for a bigger population results in lesser car sales for a given value of GDP because of GDP per person is reduced. In other research conducted by Muhammad et al. (2012) showed that GDP has positive relationship with car sales. They tested 4 independent variables GDP, inflation (CPI), UR and loan rate on automobile sales in ASEAN countries. mean group (MG) and pooled MG method used by them to examine the relationship between independent variables (GDP, CPI, UR and binary logistic regression) on dependent variable (the rate of car sales). From their result, it is revealed that the 4 variables influence the car sales in long run however insignificant during short term. The result is supported by Nawi, et al. (2013) in their study of determine the passenger car sales. In their study, they also investigate the relationship of GDP and the passenger car sales. From their result, it also showed that GDP has positive relationship with the passenger car sales. The higher GDP indicate that higher volume of passenger car sales. However, study conducted by Shahabuddin, (2009) showed that the relationship of GDP and domestic car sales is weaker compared to foreign car sales. The foreign car sales showed a strong correlation with GDP. On the other hand, Smusin and Makayeva, (2009), obtained samples from 3 countries: Belarus, Russia, and Ukraine showed that there was growth in GDP, it will cause a positive growth in car sales. Survey finding from Dargay (2001), reported that GDP and car sales are positive related. He used the data from Family Expenditure Survey from 1970 to 1995. A study by Babatsou and Zervas, (2011) in European Union countries also showed that GDP and passenger car sales had positive correlation. Figure 1 showed that Malaysia vehicle sales change with GDP change.

2.3. Unemployment Rate

Unemployment rate refer to "number of unemployed persons divided by the labor force." (Rahman, 2013). From theory, it stated that when employment rate is high, consumers have higher income, lead to more disposable income (Smusin and Makayeva, 2010). They formed a hypothesis based on the theory which the car sales will increase when the UR is low. They conducted their study based on the 3 countries: Belarus, Russia, and Ukraine. However, the result showed that there is no strong relationship between car sales and UR due to aforementioned factors. From the study by Nawi, et al. (2013), UR has a negative relationship with car sales. When the UR increased by 1%, the car sales decreased by 1.52%. Another study by Muhammad et al. (2012) showed that the Figure 1 trend of car sales and GDP per capita employment rate have significant relationship with car sales in long term. According to Badkar (2012), unemployment is one of the indicators of car sales. There is strong negative relationship between unemployment and car sales. Another study conducted by Babatsou and Zervas, (2011), there are negative relationship between the car sales and UR. Their study on European Union countries showed that when unemployment increases, the number of car sales declined.

2.4. Inflation Rate

According to Wikipedia, a CPI examines the change in the prices of a basket of consumer goods and services purchased by household. CPI also works as economic indicator. CPI can be used to measure inflation rate. The study by Nawi, et al. (2013) also examined the relationship between inflation rate and passenger car sales. The findings were supported by the theories of the analysis. Inflation rate has a negative relationship with passenger car sales. When the inflation rate increased by 1%, the car sales decreased by 3.46%. Muhammad et al. (2013) in their study found that inflation rate does not have significant long term equilibrium relationship between sales of passenger vehicle. Their study used the times series of monthly data from April 2004 to December 2010. To analyze the data, they convert the variables into log form. To determine the long and short term relationship, they used VAR. From their result, they found that inflation rate; oil price and ITR are negative related to car sales while IPPs are not. However there are no variables that affect the car sales in long term through their finding. From the study conducted by Guonason and Jonsdottir, (2009), they found that inflation rate does influence the car sales. The household purchases of private cars take up 7% in CPI in Iceland. To examine the relationship between inflation rate and car sales, Smusin and Makayeva, (2009) used CPI index from Belarus, Russia, and Ukraine to conduct their test. From their finding, the correlation for Belarus is 54% which is not high, Russia only 28% that mean no correlation. Ukraine is the lowest among 3 countries, only 3% that mean no statistical relevance. Based on their result, we can see that inflation rate is considered weak in explaining car sales.

2.5. Interest Rate

According to Cox et al. (1985), ITR is the yearly rate charged

by a creditor to a borrower in order for the borrower to get the loan. Bank lending may affect the car sales through various liquidity effects. The car sales are just like the sales of any asset. It can be decided by the discounted expected future stream of cash flows. If the financial banks provide lower lending rates, this will encourage current and future economic activity (Ong, 2013). The study of Nawi et al., (2013) examined the relationship of ITR and passenger car sales. From their finding, it showed that there is negative relationship between ITR and passenger car sales. The data used by them collected from Malaysian Automotive Association (MAA) while ITR obtained from the Department of Statistics Malaysia. The tests they deploy were ADF and Philip-Perron tests. Vector Error Correlation Model (VECM) had been run to analyze whether there are long run correlation relationship between two variables. After run the entire test, their results were consistent with the theory. In their finding, it indicated that 1% increase in ITR will decrease the car sales by 3.21%. According to Bernama (2012), car sales will be affected when there was a hike on ITR. In the other hand, study by Beck, (2003), indicated that change in ITR was less significant in car sales compared to price change. These finding were supported by Muhammad, et al. (2012) in their study. The result from their finding indicates that in long term relationship, ITR imply negative impact on car sales. Shahabuddin, (2009), conducted a study in forecasting automobile sales. The finding in his study provides evidence that ITR and car sales were negative related. When the interest on car loan increase, the car sales will be decrease. According to Eastwood and Anderson, (1976), consumer credits influence the demand for automobile. Consumers will take installment credit into their consideration when they want to purchase durable goods.

In their study, they examined the cost of funds and the period of contract. However, because they unable to find the aggregate time series data, they develop a simple model that specifies existence of relationship between percentage of down payment, ITR and the length of contract. In their model, the motive of the financial institution is to maximize profits. The profits generated through the length of contract. The ITR charge depend on how long the contract. This is because a borrower's ability to make payment will change over time due to the uncertainty in the future. Higher rates will charges on the borrower if risk and period of contract is long and high. Larger installment is required for a shorter length of contract because the maturity of contract had been shortened. From their finding, they identified that ITR, percentage of down payment and length of repayment influence the automobile sales. The evidence in their study is when the length of contract had been reduced from 30 months to 20 months, the spent of consumers on automobiles or parts declined by 13.3%. Figure 2 shows the trend of UR, inflation rate and ITR.

3. MATERIALS AND METHODOLOGY

This study investigated the relationship between different types of independent variables consists of GDP of Malaysia, Inflation rate

Figure 1: Trend of car sales and gross domestic product per capita

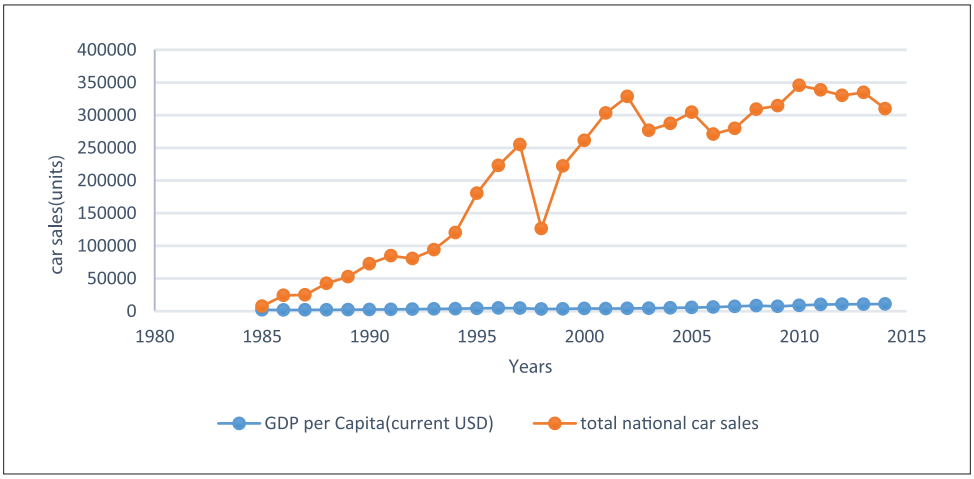
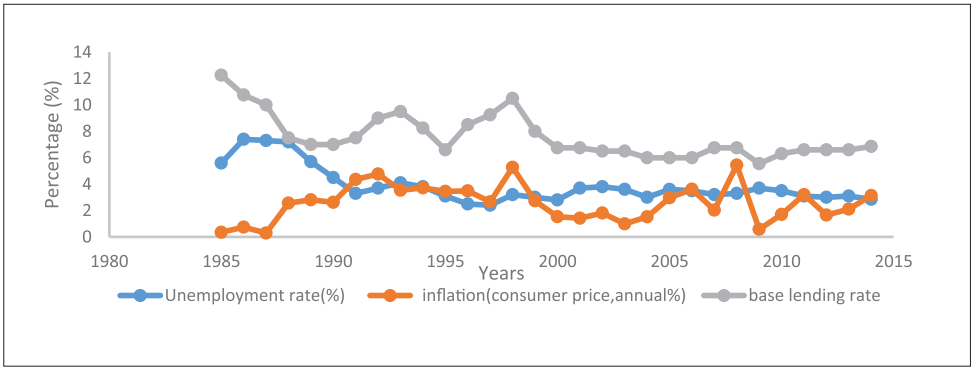


Figure 2: Trend of unemployment rate, inflation rate, and interest rate



of Malaysia, Interest rate of Malaysia and UR to the dependent variable, car sales in Malaysia. First, this study discussed the research design. Research design is the planning of conditions for gathering and analysis of data in a manner in order to combine significance to the research purpose. In simple words, overall strategy that researcher chooses.

After that, it developed hypotheses for the purpose to carry out some tests in the following part. Creswell, (1999) defined hypothesis as "a formal statement that presents the expected relations between an independent and dependent variable." It formed some hypotheses that are related to our study and test carried out to determine the accurate of the hypotheses.

3.1. Research Framework

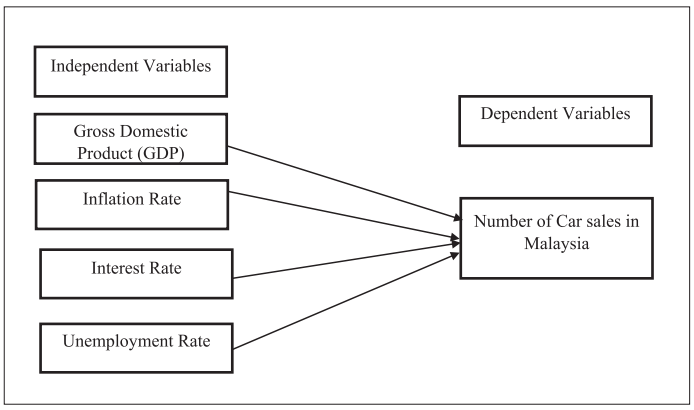
From the theoretical framework above, we can see that there are 4 independent variables to be tested out to identify their relationship with the dependent variable. The independent variables in this study are GDP, ITR, inflation rate and UR, whereas the dependent variable is car sales in Malaysia which is shown in Figure 3.

3.2. Research Design

According to Burns and Grove (2003), research design is "a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings". This study used variables to test the relationship between macroeconomic variables and car sales in Malaysia. This research uses total car sales in Malaysia as dependent variable, while independent variables represented by GDP (current USD), inflation rate, UR, and ITR on car loan. The research methodology will use descriptive statistics and quantitative analysis.

In this research, we will collect quantitative data because all the variables are measureable and presented in numerical form. The data are collected from several website on the Internet. This research carries out by using 30 years' time periods from 1985 till 2014 as the sample of analysis. Consequently, time series analyses were used in the study of car sales in Malaysia and each factor throughout 30 years. To analyze the relationship between dependent variables and independent variables in this study, linear regression will be used. The software that chosen for analyze and work with these data is the statistical software SPSS.

Figure 3: Factors that affecting the car sales in Malaysia



3.3. Hypothesis

To test the relationships, four hypotheses were developed. The hypotheses formed are the following.

Hypothesis 1 is formed to study the relationship between number of car sales and GDP in Malaysia. The GDP indicate the growth in a country, while the number of car sales relate to the performance of automobile manufacturers. The purpose of developing this hypothesis is to examine whether the GDP has significant relationship with the number of car sales in Malaysia.

H1: There is a positive relationship between number of car sales in Malaysia and GDP in Malaysia.

Hypothesis 2 developed to observe the relationship between inflation rate and number of car sales in Malaysia. The inflation rate indicates the reduction in the purchasing power per unit of money. This hypothesis is to study whether the inflation rate has significant relationship with the number of car sales in Malaysia.

H2: There is a negative relationship between number of car sales in Malaysia and inflation rate in Malaysia.

Hypothesis 3 developed to observe the relationship between UR and number of car sales in Malaysia. The UR indicates labor force that is without work but available for and seeking employment. This hypothesis is to study whether the UR has significant relationship with the number of car sales in Malaysia.

H3: There is a negative relationship between number of car sales in Malaysia and UR in Malaysia.

Hypothesis 4 developed to observe the relationship between ITR and number of car sales in Malaysia. The ITR indicates the proportion of a loan that is charged as interest to the borrower. This hypothesis is to study whether the ITR has significant relationship with the number of car sales in Malaysia.

H4: There is a negative relationship between number of car sales in Malaysia and ITR in Malaysia.

3.4. Data Collection Sampling and Procedure

Generally, we can obtain the data whether from primary or secondary sources. The primary data refers to information obtained first hand on the variables of the research. There is a restriction to get primary data that is related to this topic, so I choose to use secondary data. The secondary data refers to the data gathered from different sources that already existed such as book, journal, official website, and newspaper. I will collect the data consist of 30 years of car sales in Malaysia. The car sales are selected from two domestic automobile manufacturers Proton and Perodua. Besides, the data for GDP, inflation rate, UR, and ITR also will be collected from internet.

3.5. Data Analysis

To analyze the data obtained, I will use both descriptive and inferential statistics. By using descriptive statistical methods, the

data collected will be analyzed based on the objectives stated in Chapter 1. To examine the determinant of factors that affecting the car sales in Malaysia, multiple linear regression will be carry out. I will carry out various statistical tests using the Statistical Package for Social Science (SPSS) version 20.

3.6. Measurement of Variables

It is used multiple regression equations following the previous research by Nawi, et al. (2013) to test on car sales in Malaysia. All the independent variables are regressed together in one regression model. The variables are GDP, ITR, inflation rate, and UR. It supported by Muhammad et al., (2013) which used linear regression analysis. The independent variables used in this study also supported from previous literatures, Nawi, et al. (2013) and Muhammad et al., (2013). They used the same three independent variables to study the factor that affecting the car sales.

A linear regression analysis is chosen to examine the relationships between dependent variable and each independent variable is showing in Table 2.

Research model:

$$CS_t = \beta_0 + \beta_1 IR_t + \beta_2 GDP_t + \beta_3 Inf_t + \beta_4 Une_t + e_t$$

Where,
CS = Car sales
IR = Interest rate
GDP = Gross domestic product of Malaysia
Inf = Inflation rate
Une = Unemployment rate
e_t = Error term.

3.7. Data Analysis Techniques

3.7.1. Descriptive analysis

The summary of collected data is presented by using descriptive analysis. In the table, there will be number of observation, mean and standard deviation. The key presentation of this analysis is to illustrate the variability of the variables.

3.7.2. Correlation analysis

To present the correlation of variables, we will use correlation matrix table. Through correlation analysis, it will show the negative or positive correlation between variables. The result will show whether the relationship between studied variables are positive or negative. Correlation is a relationship between two variables where both are moving in tandem. Perfect positive correlation between variables when the value computed is +1.00, while a 0.0 mean no correlation and when the value is -1.00, it mean that a perfect negative correlation.

Table 2: Variables and measurement

Variables	Measurement
GDP	GDP in Malaysia from 1985 until 2014
Inflation rate	Inflation rate in Malaysia from 1985 until 2014
Interest rate	Interest rate in Malaysia from 1985 until 2014
Unemployment rate	Unemployment rate in Malaysia from 1985 until 2014

GDP: Gross domestic product

3.7.3. T-test

To identify the significance of the independent variables in the variables in the model, T-test could be used. Since 3 independent variables: Interest Rate, GDP, and inflation rate, were used in our study, therefore the hypotheses are as follows:

For interest rate:
$H_0: \beta_1 = 0$
$H_1: \beta_1 \neq 0$

For GDP:
$H_0: \beta_2 = 0$
$H_1: \beta_1 \neq 0$

For inflation rate:
$H_0: \beta_3 = 0$
$H_1: \beta_3 \neq 0$

For unemployment rate:
$H_0: \beta_4 = 0$
$H_1: \beta_4 \neq 0.$

If the value of t-statistic computed is bigger than the critical t-value, this means that the variable is significant, and H_0 will be rejected. But if t-statistic computed is smaller than the critical t-value, the variable is consider insignificant and do not reject H_0.

3.7.4. F-test

To investigate whether the relationships of all the variables within the model are significant simultaneously, F-test will be carried out. They are significant simultaneously if:

$$F = \frac{(SSE1 - SSE2)/m}{\frac{SSE2}{n-k}}$$

Where,
SSE = residual sum of squares,
m = number of restrictions, and
k = number of independent variables,
$H_0: \beta_1 = \beta_2 = \beta_3 = 0$
$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq 0.$

If the computed F-value is bigger than the critical F-value, the null hypothesis would be rejected, and all independent variables are significant simultaneously.

3.7.5. Multicollinearity

When fitting a regression model, multicollinearity is a problem that potentially arises. It exists when two or more of the predictors in a regression model are moderately or highly correlated. When there is multicollinearity, it makes the t-test become unreliable, where the signs of the coefficient will be varied. For example, when

we think GDP to have a positive relationship with the car sales, when we regress the GDP toward car sales and other variables, the result for relationship of car sales and GDP become negative, which is contrary from the view of macroeconomics. Therefore, multicollinearity causing problem for statistical analysis that makes researcher having difficulty to interpret the result. To examine the multicollinearity of the model, variance inflation factor (VIF) can be used. There is high multicollinearity between the variables if the independent variables have a VIF that is higher than 10.

3.7.6. Autocorrelation

Autocorrelation occur when there are correlation between the values of the same variables is based on related objects. Durbin Watson statistic (d) can be used to test for the presence of autocorrelation in time series data. Hypothesis for the Durbin Watson test are shown as below:

H_0 = No autocorrelation

H_1 = Autocorrelation exits.

If the null hypothesis is rejected, the data is correlated, and if the null hypothesis is not rejected, there are no autocorrelation.

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics

Table 3 shows the summary of descriptive statistic for the model. Mean for the UR (Unemploy) is 3.885, while standard deviation calculated for UR is 1.37007. GDP has the mean of 5086.947 and standard deviation of 2861.308. For inflation rate (INF), the mean and standard deviation calculated are 2.5693 and 1.38458. For ITR, it has mean and standard deviation 7.6033 and 1.65659. Last, the car sales show a mean 206885.7 and standard deviation is 116,635.2. From the result, it can be seen that the entire mean are greater than standard deviation.

4.2. Correlation Analysis

To determine the level of relationship between each tested variables, correlation analysis has been carry out. Correlation of +1 or −1 shows perfect positive or perfect negative relationship. When the value is 0, it means that there is no relationship. Car sales have positive relationship with GDP. The relationship between car sales and GDP is considered big as the value greater than 0.5. Car sales have negative relationship with UR, inflation rate, and ITR. The relationship between car sales with UR and ITR is considered large. Large relationship occurs when the correlation is more than 0.5. However, the relationship between car sales and inflation rate is small because the value is only 0.0498 which is shown in Table 4.

Table 3: Summary of descriptive statistics

Variable	n	Mean	Standard deviation
Unemploy	30	3.885	1.37007
GDP	30	5086.947	2861.308
INF	30	2.5693	1.38458
BLR	30	7.6033	1.65659
Carsale	30	206885.7	116635.2

4.3. Regression Analysis

4.3.1. Regression analysis of specified model

Table 5 shows the result for R-square. R-square showed how much percentage of the variance can be explained by the estimated model. The R-square can differ from 0 to 100. An R^2 of 100 mean that the entire index is completely explained by the variable. In this model, R^2 is 87%, so this means that the car sales in Malaysia (dependent variable) are explained by the independent variables are 87%. Adjusted R^2 is a modified version of R^2, used to compensate for the additional variable in the model. Adjusted R^2 in this context is 85.7%.

Unemployment rate is significant at 1%, 5% and 10% level. When UR increase by 1%, the car sales decrease by 38,866 units. This indicates that there is negative relationship between UR and car sales. This results consistent with the studies done by Nawi, et al. (2013), Muhammad, et al. (2012) and Babatsou and Zervas, (2011) which also get negative relationship between UR and car sales.

GDP has positive relationship with car sales in Malaysia. GDP is significant at 1%, 5%, and 10%. When GDP increase by 1%, the car sales unit increases by 16 units. This implies that when there is increase in GDP, the car sales will increase. This result is because increase in GDP with increase the purchasing power of consumer, therefore increase the demand for car and increase the car sales. This result is highly supported by Nawi, et al. (2013), Smusin and Makayeva, (2009), Dargay (2001) and Babatsou and Zervas, (2011). However in contrast, study conducted by Shahabuddin, (2009) showed that the relationship of GDP and domestic car sales is weaker compared to foreign car sales.

The result for inflation rate showed that there is negative relationship between inflation rate and car sales. The inflation rate is significant at 1%, 5% and 10%. When the inflation rate increase by 1%, the car sales decline by 21,409 units. This result is because inflation rate has increase the price of the car and cause in decrease in the car sales. The real purchasing power of consumer have declined. This result is similar with the previous study done by Nawi, et al. (2013), Muhammad, et al. (2013), Guonason and Jonsdottir, (2009) and Smusin, and Makayeva, (2009).

Table 4: Correlation between variables

Variable	Year	Unemployment	GDP	Inflation	Interest rate	Car sales
Year	1					
Unemployment	−0.6596	1				
GDP	0.9264	−0.5442	1			
Inflation	0.0324	−0.387	0.0583	1		
Interest rate	−0.6845	0.4485	−0.5447	−0.0134	1	
Car sales	0.9363	−0.7123	0.8015	−0.0498	−0.7191	1

GDP: Gross domestic product

This present study also found that ITR has negative relationship with car sales in Malaysia. The ITR is significant at 1%, 5% and 10%. When ITR increase by 1%, the car sales has decrease by 20,865 units. This result is because the higher the ITR, consumers need pay more for purchase a car and decline the intention to buy a car and decrease in car sale. This result consistent with previous studies by Nawi, et al. (2013), Bernama (2012), by Beck, (2003) and Shahabuddin, (2009).

4.4. Multicollinearity and Autocorrelation Results

To detect the presence of multicollinearity, multicollinearity was conducted. The easiest method to detect multicollinearity is through VIF. Through multicollinearity test, we can check whether the explanatory variables in our model are highly linearly correlated. An optimum value of VIF is between 1 and 10. If the value greater than 10, it mean that the independent variables have high correlations and lead to a multicollinearity problems. All four independent variables were tested in one equation. To summarize the result, all VIF for UR, GDP, inflation rate, and ITR are ranging from 1.244 to 1.847. This indicates that the value for regression is good because fall in the range of 1-10. The problems of multicollinearity doesn't exist which is shown in Table 6. To detect the presence of autocorrelation, Durbin–Watson test was carrying out. The upper limit is 1.739 and the lower limit is 1.143. The value of Durbin–Watson is 1.179 and fall between upper limit and lower limit, therefore it is inconclusive.

Since the Durbin–Watson statistic value fall in inconclusive zone, we need to carry out the run test. If the number of run is between 1.8069 and 30.19, autocorrelation does not exist. From the finding, number of run is 12, so it can be concluded that there is no autocorrelation in this model which is shown in Table 7.

Table 5: Regression analysis of the specified model

Model	Coefficients	Standard error
(Constant)	487272.344	68213.317
Unemployment	−38866.811	8126.244
GDP	16.565	3.758
Inflation	−21409.013	6599.297
Interest rate	−20865.815	6089.777
R^2	0.877	
Adjusted R^2	0.857	

GDP: Gross domestic product

Table 6: Multicollinearity and autocorrelation results

Model	Collinearity statistics	Autocorrelation statistics
	VIF	D-W statistic
(Constant)		1.179
Unemployment	1.847	
GDP	1.723	
Inflation	1.244	
Interest rate	1.517	

GDP: Gross domestic product, VIF: Variance inflation factor

Table 7: Run-test of specified model

Number of positive residual	15
Number of negative residual	15
Number of run	12
Mean (E[K])	16
Variance	14.1913

4.5. F-test

From the regression result, we can see that the computed F value is 44.429, which is higher than the F-critical value 4.18 at 1% significance level.

$H_0: \beta_1 = \beta_2 = 0$

$H_1: \beta_1 \neq \beta_2 \neq 0.$

Therefore, we would reject H_0, the variables simultaneously significant which is shown in Table 8

4.6. T-test

T-test would test the significance of the independent variables in the model, as we regress car sales in Malaysia against UR, GDP, ITR and UR, we obtain the following result:

From the result, we can see that all independent variables: UR, GDP, inflation rate, and ITR are significant in the model.

For UR, the hypothesis is

$H_0: \beta_1 = 0$

$H_1: \beta_1 \neq 0.$

Table 8: ANOVA

Model	Sum of squares	df	Mean square	F	Significant
Regression	345855895951.533	4	86463973987.883	44.429	0.000
Residual	48653313159.134	25	1946132526.365		
Total	394509209110.667	29			

Table 9: Coefficients

Model	Unstandardized coefficients		Standardized coefficients	t	Significant
	B	Standard error	Beta		
(Constant)	487272.344	68213.317		7.143	0.000
Unemployment	−38866.811	8126.244	−0.457	−4.783	0.000
GDP	16.565	3.758	0.406	4.408	0.000
Inflation	−21409.013	6599.297	−0.254	−3.244	0.003
Interest rate	−20865.815	6089.777	−0.296	−3.426	0.002

GDP: Gross domestic product

Table 10: Result of the hypothesis findings

Variables	Measurement	Result
GDP	GDP in Malaysia from 1985 until 2014	Supported
Inflation rate	Inflation rate in Malaysia from 1985 until 2014	Supported
Interest rate	Interest rate in Malaysia from 1985 until 2014	Supported
Unemployment rate	Unemployment rate in Malaysia from 1985 until 2014	Supported

GDP: Gross domestic product

At 5% significance level, since the t value (−4.783) is more negative than the critical t value (−1.95), reject H_0. Therefore, the UR is significant which is shown in Table 9.

For GDP, the hypothesis is,
H_0: $\beta_1 = 0$
H_1: $\beta_1 \neq 0$.

At 5% significance level, since the t-value (4.408) is higher than the critical t value (1.95), so reject H_0. Therefore, the GDP is significant.

For inflation rate, the hypothesis is,
H_0: $\beta_1 = 0$
H_1: $\beta_1 \neq 0$.

At 5% significance level, since the t value (−3.244) is more negative than the critical t-value (−1.95), so reject H_0. Therefore, the inflation rate is significant.

For ITR, the hypothesis is,
H_0: $\beta_1 = 0$
H_1: $\beta_1 \neq 0$.

At 5% significance level, since the t value (−3.426) is more negative than the critical t-value (−1.95), so reject H_0. Therefore, the ITR is significant which is shown in Table 10.

5. CONCLUSION

The car sales of national car have become a concerned issue to the government in recent years. This is because the national car market has decline in these few years due to the aggressive competition of imported cars. In general, the findings in this study shows that the macroeconomic variables have relationship with the car sales. From the analysis results, it can see that GDP has positive relationship with the car sales, whereas UR, inflation rate and ITR have negative relationship. This indicates that the car sale is dependent on the GDP. While GDP per capita indicate an economic level in a country, a good income position will increase the car sales in Malaysia. However, if the UR and inflation rate is high, the car sales will decrease. This is because when people have no jobs, they don't have income and unable to afford to buy a car. The higher the ITR, the less intention for a consumer to buy a car because they pay more.

From the finding, it shows that GDP in Malaysia have a steady growth. This make car sale in Malaysia increase except for few years when economic is not good. The inflation rate and UR in Malaysia also relatively low compare to other countries according the study from other researcher.

However, from the study of other researcher, macroeconomic variables are not the only factors affecting the car sales in Malaysia. Consumer tends to purchase imported cars than national cars because they believe that imported cars are more quality than the national cars (Poon, 2005).

The car sales of Proton and Perodua decline because the cost of national car is quite high compare to the imported car in the same price range but offer a better quality. The domestic car manufacturers transfer their cost to the sales price making them unable to compete with the imported cars. Moreover, the domestic manufacturers didn't have competitive advantages in the car parts and equipment which lead to increase in production cost.

From the study conducted, we found that GDP are positive related to the car sales. When GDP increase, the car sales will increase. So, I recommended the relevant parties should introduce policies that consistent with the Vision 2020 was launched by Tun Dr. Mahathir Mohammad in 1990. It was developed to be a long-term nation goal for the nation, the goal of Malaysia becomes fully developed country by years 2020. When the government putting their effort to achieve this Vision 2020, they required annual growth rate of 7%. In other words, GDP had to be doubled every 10 years. From our finding, we can see that the car sales are positive related to the GDP. Therefore, when government trying to achieve the Vision 2020, the national car sales will increase.

Through the support and collaboration from relevant government agencies and institutions, the Vision 2020 will be achieved, GDP will continue to grow and car sales will increase.

From the study, we get the results that unemployment have negative relationship with the car sales in Malaysia. This means that when unemployment increase, the car sales in Malaysia will decrease. So, in order to increase the car sales, government can put their effort in solving UR. The government has introduced Malaysian Economic Transformation Program (METP) as a comprehensive move to make Malaysia into a develop country when the year 2020. This program can decrease the UR in Malaysia because when the economy of the country growing faster, it lead to more opportunity for the jobs. The employers need more employees when their business expands and this lead to a decline in UR. Therefore, government should strengthen its effort in implementing the METP and lead to lower UR.

This study examines the relationships between car sales in Malaysia with GDP, UR, inflation rate, and ITR. Only national car sales is been analyze to determine which independent variable affecting it. The data were collected from the internet from year 1985 to 2014. Multiple regression analysis conducted to examines the relationship between dependent and independent variables.

Multicollinearity and autocorrelation test conducted to predict the presence of these two problems.

The results showed that only GDP has positive relationship with the car sales. All the other three independent variables are negative relate to car sales in Malaysia. There is no multicollinearity and autocorrelation in the study.

As a conclusion, the GDP have significant effect on the car sales in Malaysia. Policy maker in Malaysia should pay more attention on GDP in order to increase the car sales in Malaysia and also focus on the inflation rate and UR. Lower ITR should be charged on the car loan so that the car sales can increase.

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